State of California

THE RESOURCES AGENCY

Department of Water Resources

BULLETIN No. 119-14

FEASIBILITY OF SERVING THE DUDLEY RIDGE WATER DISTRICT FROM THE STATE WATER PROJECT

AUGUST 1964

HUGO FISHER
Administrator
The Resources Agency

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources

State of California

THE RESOURCES AGENCY

Department of Water Resources

BULLETIN No. 119-14

FEASIBILITY OF SERVING THE DUDLEY RIDGE WATER DISTRICT FROM THE STATE WATER PROJECT

AUGUST 1964

HUGO FISHER
Administrator
The Resources Agency

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources

FOREWORD

In November 1960, the California Water Resources Development Bond Act was approved by the State's electorate, paving the way for the construction of the State Water Project as the first phase of the California Water Plan. Since that time, many local water service agencies throughout the State have contracted with the State for water service from the proposed facilities. Several water agencies have been organized since November 1960 expressly for the purpose of obtaining supplemental water supplies from the state facilities for the areas they represent.

Prior to executing water supply contracts with water agencies, the Department of Water Resources makes studies of these agencies and the areas encompassed by them to determine the propriety of entering into such contracts. These studies are made with the goal of evaluating (1) each area's future demand for supplemental water supplies, (2) the legal ability of each agency in question to enter into a water supply contract with the State, (3) the engineering feasibility of providing the proposed water service, and (4) the financial ability of the agency to contract for a supplemental water supply from the State Water Project.

The results of the studies made for each agency, as described above, along with significant incidental and supporting material, are embodied in reports published by the Department of

Water Resources. This bulletin is one of a series of such publications and describes studies which led to the signing of a contract with the Dudley Ridge Water District on December 13, 1963. The contract provides for the delivery of a maximum annual entitlement of 50,000 acre-feet of water from the California Aqueduct. The contract must be approved by the Districts Securities Commission.

TABLE OF CONTENTS

TABLES

PLATES

Plates are bound at end of report.

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

EDMUND G. BROWN, Governor
HUGO D. FISHER, Administrator, The Resources Agency of California
WILLIAM E. WARNE, Director, Department of Water Resources
ALFRED R. GOLZE, Chief Engineer
JOHN R. TEERINK, Assistant Chief Engineer

San Joaquin Valley Branch

This report was prepared under the direction of

Carl L. Stetson . . . . . Chief, San Joaquin Valley Branch

by

Leland R. Illingworth . . . . . Supervising Engineer
Richard W. Meffley. . . . . .Senior Engineer

Assisted by

Stanley T. Nelson . . . . . Associate Engineer
Ralph L. Worrell. . . . . .Associate Economist
Bill S. Satow . . . . . .Associate Economist
Mike A. Campos. . . . . .Junior Civil Engineer
Joseph D. Auburg. . . . . .Junior Economic Analyst

This report was prepared in coordination with the Division of Operations

Robin R. Reynolds . . . . . .Division Engineer
Wayne MacRostie.. . . . . Chief,Contracts and Repayment Branch

CALIFORNIA WATER COMMISSION

RALPH M. BRODY, Chairman, Fresno

WILLIAM H. JENNINGS, Vice Chairman, La Mesa

JOHN W. BRYANT, Riverside

JOHN P. BUNKER, Gustine

IRA J. CHRISMAN, Visalia

EDWIN KOSTER, Grass Valley

JOHN J. KING, Petaluma

NORRIS POULSON, La Jolla

MARION R. WALKER, Ventura

-----O-----

WILLIAM M. CARAH
Executive Secretary

ORVILLE L. ABBOTT
Engineer

CHAPTER I. INTRODUCTION

The Dudley Ridge Water District was formed for the purpose of obtaining a water supply from the State Water Project for irrigation of land in southern Kings County. A contract between the State and the District for such a supply was executed on December 13, 1963. Presented in this report are factual data which demonstrate the need for and the feasibility of the contract which provides for the supply of a maximum annual entitlement of 50,000 acre-feet of water from the California Aqueduct and includes an option to contract for a share of the project yield uncontracted on December 31, 1963.

This chapter describes the District and its history, economy, powers, and service area. Also included is a statement concerning the water supply available to the San Joaquin Valley from the State Water Project. In the following chapters, there are presented discussions of the potential water demand, the cost of water service from the State Water Project, and the demand for project water as limited by cost of water. The report is concluded with an analysis of the financial feasibility of the District's purchasing water from the State.

In the course of contract negotiations with the District, there were available for consideration the Department of Water Resources' office report "Supplement to Information and Data on Proposed Program for Financing and Constructing State Water Facilities" dated May 1960; "Engineer's Report on Irrigation Project Development" prepared for Dudley Ridge Water District by Stoddard and Karrer; and the department's Bulletin No. 3, "The

California Water Plan". These reports provided the bases for negotiations, along with the prototype water supply contract between the State and The Metropolitan Water District of Southern California; the "Standard Provisions for Water Supply Contract" approved August 3, 1962; and Bulletin No. 132-63, "The California State Water Project in 1963".

During 1962 and 1963 several meetings were held with the directors and consulting engineer of the District. A number of studies were made and presented by the department to show charges which would be made by the State to the District for water under different assumptions as to maximum annual entitlement, rate of buildup of demand, and points of delivery.

The Dudley Ridge Water District

Prior to the formation of the District, it was generally recognized that an additional supplemental water supply was essential to improve the economy in the vicinity of the California Aqueduct in southern Kings County. Landowners in the area realized that the aqueduct could provide this additional water supply and petitioned the Board of Supervisors of Kings County to form a district under the California Water District Law (1913 Act) for the purpose of contracting for a supply of water from the aqueduct. The Dudley Ridge Water District was approved by the voters January 8, 1963, and the Kings County Board of Supervisors declared the District formed on January 21, 1963.

The California Water District Law is contained in Division 13, Sections 34000 through 38501, of the California Water Code. The code describes district powers and duties and

prescribes the procedures for district formation, organization, management, and financing.

Powers of the District

General. The District may acquire, construct, and operate works necessary to provide water and related drainage and reclamation (Section 35401), and also works for sewage disposal (Section 35500). Portions of the territory within the District may be formed into improvement districts (Sections 36410, 36450) or distribution districts (Section 36460) to bear the costs of certain works benefiting only those areas. Only landowners may vote in district elections (Section 34027), on the basis of one vote for each dollar of assessed valuation (Section 35003).

Contracts. The District may enter into such contracts as are necessary to carry out the purposes of the District (Section 35406). The District is given specific authority to contract with the State for the purpose of developing water supplies (Section 35851). (Contracts entered into pursuant to Section 35851 must be approved by the California Districts Securities Commission (Section 35854).) The District is also empowered to contract for water from the State Water Project by provisions of the Central Valley Project Act (see Water Code Sections 11102, 11625, 11661, and 11662).

Fiscal Powers. The District may obtain funds by water charges (Section 35470) and by ad valorem assessment of land, exclusive of improvements and mineral, oil, and gas rights (Section 36550 et seq., Section 37200 et seq.). Subject to varying restrictions, funds may be raised within an improvement district

by water charges (Sections 36451, 23800 et seq.), assessment according to benefits (Sections 36451, 23626), or ad valorem assessment (Sections 36452, 23532); and within a distribution district by water charges (Section 36522) or by assessment according to benefits (Section 36471). The District may issue both general obligation and revenue bonds (Section 35950 et seq.). The issuance of general obligation bonds must be approved by a two-thirds vote and revenue bonds by a majority vote (Section 35155). The District may incur a short-term debt (by issuing warrants payable at a future time) without holding an election (Section 36400). General obligation bonds (Section 36151) and warrants (Section 36408) must be authorized by the Districts Securities Commission. General obligation bonds (Sections 36423, 36451, 23913) or warrants (Sections 36451, 23975) of the District for an improvement district may also be issued.

The District's Service Area

The potential service area of the Dudley Ridge Water District is the entire District which is composed of 47,180 acres. The District is located in Kings County on the westerly edge of the San Joaquin Valley, as shown on Plate 1, "Location of Dudley Ridge Water District". The District lies to the south of Kettleman City and is bounded in part on the north and east by the Tulare Lake Basin Water Storage District and the Hacienda Water District, on the south by the Kings-Kern County line, and on the west by a line approximating the proposed alignment of the California Aqueduct.

The economy of the District is based on irrigated

agriculture and livestock grazing. The District is virtually uninhabited at the present time. The nearest population center of any consequence is the community of Kettleman City on State Highway 41 near the northern tip of the District. It is anticipated that the purchase of water from the State will allow further development of irrigated agriculture and will enhance the economy of the District; however, future urban development within the District is not likely.

Development of irrigated agriculture has been limited by the lack of an adequate water supply. Records of a land use survey of the San Joaquin Valley by the department in 1958 indicate there were 6,800 acres of irrigated land and 1,890 acres of fallow land within the present boundaries of the District. The irrigated land was about equally divided between cotton and grain crops, but there was some land devoted to alfalfa and pasture. Presently about 9,100 acres are irrigated. Most of this land is located in the west-central section of the District, but a portion is located along the edge of the Tulare Lake Bed in the northern section of the District. Water supply for the west-central section is conveyed some forty miles from sources located to the east outside the District. The northern section receives its supply from local wells. Dry farming in the District is practically non-existent because of the arid climate; however, land has been utilized for many years during the winter and spring months for livestock grazing.

The climate of the region encompassing the District is characterized by hot dry summers, and cool winters with low annual rainfall. Although no climatological data have been published for locations in the District, the following characteristics have been

estimated from records from nearby Weather Bureau Stations. The average annual rainfall in the District is about 6.5 inches. Precipitation occurs generally from November through March. In July, the hottest month, the average maximum temperature is about 100° Fahrenheit, and in January, generally the coldest month, the average minimum temperature is about 37° Fahrenheit. Ground or tule fogs are common during winter months and occasionally persist for days or weeks. Sometimes winds of high velocity occur during the late spring months.

Most of the land of the District is smooth-lying, and elevations range from about 190 feet along the edge of the Tulare Lake Bed to about 350 feet in the Kettleman Hills on the westerly edge of the District.

Water Supply Available to San Joaquin Valley From State Water Project

The California Water Commission has assigned certain state applications for appropriation of water to the department for the operation of the State Water Project. The applications show that as of December 1963 the water appropriated would be used in the following service areas:

Feather River	210,000 acre-feet
North Bay	181,000 acre-feet
South Bay	210,000 acre-feet
San Joaquin Valley	1,547,000* acre-feet
Central Coastal	85,000 acre-feet
Southern California	1,917,000 acre-feet
Total	4,150,000 acre-feet

Although the above tabulation shows 4,150,000 acre-feet of water would be diverted for use in the indicated service areas, the prototype contract states that the contracted maximum annual entitlement may not in the aggregate exceed 4,000,000 acre-feet or the minimum project yield, whichever is the lesser. The term "minimum project yield" is defined in Article 1(k) of the "Standard Provisions for Water Supply Contract" and is now estimated to be 4,000,000 acre-feet.

As of mid-December 1963, when the water supply contract between the State and the Dudley Ridge Water District was in the final negotiation stage, the only San Joaquin Valley contract which had been consummated was that with Kern County Water Agency for 1,000,000 acre-feet. Other San Joaquin Valley contracts under consideration totaled 167,500 acre-feet. Thus 379,500 acre-feet of water for annual entitlements were available for contracting with the District.

*Includes 36,000 acre-feet reserved for San Joaquin Valley but not to be transferred from South Bay and Central Coastal allocations until needed and 36,000 acre-feet transferred from North Bay and Feather River allocations to an unallocated pool held in reserve for San Joaquin Valley when and if needed and for any other area of the State if not required in the San Joaquin Valley.

In addition to annual entitlements under water supply contracts, surplus water will be available from the project. The amounts of surplus water assumed to be delivered to the District on an irrigation demand schedule are shown in Column 3 of Table 7, "Financial Analysis - Dudley Ridge Water District".

CHAPTER II. POTENTIAL WATER DEMAND

Presented in this chapter are discussions of the factors affecting agricultural water demand and an estimate of the potential water demand in the Dudley Ridge Water District based on a consideration of classification of land, unit water use, and market demand, but disregarding the cost and availability of water. The latter are considered in Chapters III and IV.

Presented first are land classification data, estimates of unit water requirements, and a discussion of market outlook. These are followed by a determination of the potential requirement for water and an analysis of the present water supply conditions. The chapter is concluded with a determination of the potential requirement for imported water calculated as the difference between the potential requirement and the present water supply.

As stated in Chapter I, it is not likely that there will be any urban development in the District. Therefore, the entire potential demand determined herein is agricultural.

Agricultural Water Demand Factors[1]

Classification of Lands

A land classification survey was conducted by the Department of Water Resources in the San Joaquin Valley during the period 1956-61. Based on that survey and upon the collection of additional field data in 1963 during the contract

---

1/For additional information concerning these factors, see "Appendix to Final Report, General Evaluation of the Proposed Program for Financing and Constructing the State Water Resources Development System of the State of California, Department of Water Resources", October 1960, by Chas. T. Main, Inc.

negotiation period, the District was divided into two zones for investigational purposes. These zones are shown on Plate 2, "Dudley Ridge Water District".

Zone I generally consists of the higher western portion of the District adjacent to the California Aqueduct and contains land better suited for agricultural development. This zone comprises permeable alluvial fans with free draining characteristics and contains approximately 30,750 acres.

Zone II consists of the remaining 16,430 acres in the eastern portion of the District. This land will develop slowly because of the high costs of bringing it into production. An additional future item of costs for providing drainage may occur when land in Zone II does develop.

Table 1, "Classification of Irrigable Land in Dudley Ridge Water District", is based on data obtained from the land classification survey and the data collected during the contract negotiation period.

TABLE 1

CLASSIFICATION OF IRRIGABLE LAND
IN DUDLEY RIDGE WATER DISTRICT
(In acres)

	Valley Land of Excellent Quality 1/	Valley Land of Medium Quality 2/	Valley Land of Poor Quality 3/	Sloping Land 4/	Total
Zone I	21,280	6,910	1,490	1,070	30,750
Zone II	710	7,100	8,590	30	16,430
Totals	21,990	14,010	10,080	1,100	47,180

1/ Land classified as V and Vs
2/ Land classified as Vp, Vl, Vls, Vps, and Vss
3/ Land classified as Vsa, Vpss, and Vpsa
4/ Land classified as H, Hp, Hls, and Mp

Note: For definitions of land classification symbols see Department of Water Resources' "Report on Proposed Belridge Water Storage District, Kern County", December 1961.

Unit Use of Applied Agricultural Water

Estimated values of unit use of applied water for crops projected in the Dudley Ridge Water District are tabulated in Table 2, "Unit Use Values of Applied Water for Crops Projected in Dudley Ridge Water District".

TABLE 2

UNIT USE VALUES OF APPLIED WATER FOR CROPS PROJECTED IN DUDLEY RIDGE WATER DISTRICT

Crop	Acre-feet of Water per Acre of Irrigated Land
Alfalfa, seed	3.2
Cotton	3.8
Deciduous fruit and nuts	2.9
Miscellaneous field	2.1
Grain	1.1
Pasture	4.1
Potatoes	3.0
Sugar beets	2.9
Miscellaneous truck (cantaloupes)	2.4
Grapes	3.1

Market Outlook

In an office study entitled "Market Outlook for Selected California Crops, 1960-2020", the department estimated future demand for specialty farm products grown in California. That study was used as a guide, together with other criteria, in estimating the District's share of the total California 1990 market for specialty farm crops. This determination took into consideration the historical shifts in the production of crops among different producing areas in California. The historical regional crop production shifts for the past 40 years were plotted and projected to 1990.

Tentative Crop Pattern

From the market outlook study for specialty crops and estimated values of 1990 crop yields, the acreage necessary to supply the market demand for specialty crops in the District was determined. A tentative crop pattern was prepared for this acreage and the remaining acreage of the District on which non-specialty crops would be grown.

On the basis of preliminary studies it was concluded that it would be infeasible to irrigate the entire District in the near future. Specifically, the land of Zone II was eliminated from further consideration because of the high cost of bringing the land into production. That this was a reasonable conclusion is substantiated by studies reported in Chapter IV which indicate that it is economically feasible to irrigate only a portion of the land in Zone I.

The 1990 projected crop pattern in Zone I of the District is shown in Table 3, "Projected Cropping Pattern in Zone I of Dudley Ridge Water District in 1990 Based on Consideration of Soils and Market Outlook". The acreage shown therein is the net acreage in the zone after making ten percent reductions in the gross areas reported in the land classification table for the portions of the irrigable land that would be occupied by farm lots, highways, canals, etc.

Potential Water Requirement

There is a potential requirement of about 85,000 acre-feet annually in Zone I of the Dudley Ridge Water District. This amount is the sum of the products of the crop acreages in Table 3

nd the appropriate unit use values of applied water in Table 2. he determination of this quantity is based on consideration of he previously described agriculture water demand factors, but isregards the economic factor of water cost and the availability f water. The effect of water cost on demand for water is consid-red in Chapter IV. No potential water requirement was determined or Zone II of the District.

TABLE 3

PROJECTED CROPPING PATTERN
IN ZONE I OF DUDLEY RIDGE WATER DISTRICT IN 1990
BASED ON CONSIDERATION OF SOILS AND MARKET OUTLOOK

Crops :	Net Acres
Major Irrigation Season	
Alfalfa, seed	3,800
Cotton	8,200
Deciduous fruit and nuts	1,400
Miscellaneous field	7,000
Pasture	640
Sugar beets	1,800
Miscellaneous truck (including potatoes)	2,000
Grapes	700
Fallow	2,000
Minor Irrigation Season	
Miscellaneous truck	(1,150)
Grain	(3,600)
TOTAL	27,540

ote: Amounts in parentheses indicate double cropped acreage grown in fall-winter-spring irrigation season. Such acreage is included only once in the total.

Present Water Supply

Surface Water Supply

For all practical purposes there is no local surface supply available to the District. Only occasionally during storms do the normally dry arroyos of the Kettleman Hills have sufficient runoff to reach the District.

At present the principal water supply for irrigation of land in the District is conveyed some 40 miles from sources located to the east outside the District. It is estimated that about 21,000 acre-feet were imported to irrigate some 8,000 acres in 1961. It is planned that this supply will be used outside the District when water is received from the California Aqueduct.

Ground Water Conditions

There are some producing water wells in the extreme northern portion of the District which provide a small portion of the present water supply. Most wells that have been drilled, however, have been abandoned due to poor yield and poor quality of ground water. Studies made for this report indicate that it would be physically possible to recapture percolate from the future imported supply, but the quality of water underlying the area would make it unsuitable for reuse, at least for a significant period of years.

Potential Requirement for Imported Water

The potential requirement for imported water in Zone I of the Dudley Ridge Water District is equal to the potential water requirement since nearly all the present water supply will

be discontinued and reuse of percolate from the future imported supply would be impractical. The potential requirement in Zone I for imported water from the California Aqueduct is thus about 85,000 acre-feet annually.

As is indicated in Chapter I, more than this amount of water is available from the State Water Project for the District. Therefore, this is the amount of water which would be required for Zone I of the District if costs were not a factor. The analysis in Chapter IV indicates, however, that costs are a factor and consequently the import requirement is limited by the capacity of the District to pay for water.

CHAPTER III. COST OF WATER SERVICE FROM THE STATE WATER PROJECT

The cost to the Dudley Ridge Water District for water service from the State Water Project is dependent upon the allocation to the District of its share of the costs of the project facilities for conservation and transportation plus the cost of local conveyance systems for distribution of water. The State Water Project will be constructed by the State primarily with funds provided under terms of the Water Resources Development Bond Act of 1960. Local conveyance systems will be constructed and financed by the District.

Allocation of project costs is governed by the contract executed on November 4, 1960, between the State and The Metropolitan Water District of Southern California. This contract is the department's prototype water supply contract. The department's publication "Standard Provisions for Water Supply Contract" approved August 3, 1962, is based on the prototype contract.

The standard provisions set forth the terms which will be generally applicable to all contracts, and establish the mutual obligations of the State and the water supply contractors. The State's essential obligation is to make available for delivery to the contracting agency, at its delivery structures, designated amounts of project water each year, commencing with the year of initial water delivery and continuing through the life of the contract. The essential obligation of the contracting agency is to make all payments required under the contract.

Cost of State Water

Under terms of the prototype water supply contract, each contracting agency will be charged for certain quantities of "entitlement water", i.e., water which the State is obligated to deliver. In addition, surplus water which will be available to each agency will be charged on a different basis.

Cost of Entitlement Water

Water charges for entitlement water under the contract are made for the payment of the conservation works and for the transportation facilities necessary to deliver the water. Charges for these purposes are called, respectively, the Delta Water Charge and the Transportation Charge.

Delta Water Charge. Every contractor for project water will pay annually for each acre-foot of water an amount designated as the Delta Water Charge. This charge, together with revenues derived from power generated in connection with the operation of project conservation facilities, will return to the State all reimbursable costs of the conservation facilities over the project repayment period.

The Delta Water Charge is established at a rate of $3.50 per acre-foot through the year 1969 and is estimated to be $5.46 per acre-foot for the period 1970 through 1977 and $7.34 per acre-foot thereafter until supplemental conservation facilities, as defined in the standard provisions, are constructed. Estimated charges for this component for the demand buildup developed in Chapter IV are included in Table 4, "Summary of Annual Charges to Dudley Ridge Water District for Water from the State Water Project".

TABLE 4

SUMMARY OF ANNUAL CHARGES TO DUDLEY RIDGE WATER DISTRICT
FOR WATER FROM THE STATE WATER PROJECT
(In dollars unless otherwise noted)

Calendar Year	ANNUAL ENTITLEMENTS (In acre-feet)	ALLOCATED TRANS-PORTATION CAPITAL COSTS	TRANSPORTATION CHARGE				DELTA WATER CHARGE	TOTAL WATER CHARGES
			Capital Cost Component	Minimum OMP & R Component	Variable OMP & R Component	Total Trans-portation Charge		
1964	0	985,000	0	0	0	0	0	0
1965	0	1,030,500	0	0	0	0	0	0
1966	0	997,000	0	0	0	0	0	0
1967	0	760,300	0	4,400	0	4,400	0	4,400
1968	10,000	113,300	51,900	24,300	57,900	134,100	35,000	169,100
1969	11,800	14,800	61,200	28,400	57,900	147,500	41,300	188,800
1970	13,600	300	70,500	31,900	60,100	161,900	74,300	236,200
1971	15,500	44,800	80,400	34,500	57,100	172,000	84,600	256,600
1972	17,300	0	89,700	35,600	65,400	193,700	94,500	288,200
1973	19,100	0	99,100	38,400	70,800	208,300	104,300	312,600
1974	20,900	300	108,400	38,400	77,200	224,000	114,100	338,100
1975	22,700	44,800	117,700	38,300	83,500	239,500	124,000	363,500
1976	24,500	0	127,100	38,800	94,700	260,600	133,800	394,400
1977	26,300	300	136,400	38,900	101,300	276,600	143,600	420,200
1978	28,200	44,800	146,300	39,200	111,700	297,200	207,000	504,200
1979	30,000	0	155,600	39,200	118,600	313,400	220,200	533,600
1980	31,800	0	164,900	41,500	130,200	336,600	233,400	570,000
1981	33,600	0	174,300	41,400	136,900	352,600	245,600	598,200
1982	35,500	0	184,100	41,700	147,900	373,700	260,600	634,300
1983	37,200	0	192,900	41,700	155,100	389,700	273,000	662,700
1984	39,100	0	202,800	41,700	162,600	407,100	287,000	694,100
1985	40,900	16,400	212,100	41,700	169,900	423,700	300,200	723,900
1985	42,700		221,500	40,100	155,800	417,400	313,400	730,800
1987	44,500		230,800	40,000	159,700	430,500	326,600	757,100
1988	45,400		240,700	39,800	163,700	444,200	340,600	784,800
1989	48,200		250,000	39,700	167,300	457,000	353,800	810,800
1990-2035	50,000		259,300	39,400	169,300	468,000	367,000	835,000
TOTALS	2,939,800	4,052,600	15,246,200	2,654,400	10,293,100	28,193,700	21,193,900	49,387,600
EQUIVALENT UNIT RATES (In dollars per acre-foot)			5.19	1.08	3.55	9.92	6.97	16.89

Transportation Charge. In addition to the Delta Water Charge, contractors receiving water from the State Water Project will pay for the construction and operation of the transportation facilities. Articles 23 through 28 of the standard provisions govern the determination of the transportation charge.

The allocation of the costs to each contractor of construction and operation of the transportation facilities is made on the basis of a proportionate use of facilities. The construction cost and the minimum or fixed operation, maintenance, power, and replacement costs are allocated on the basis of the maximum annual entitlement and peaking capacity provided for the district within each reach of the aqueduct which would be used to convey water to the district. The variable operation, maintenance, power, and replacement costs are allocated on the basis of the relative amount of water delivered to the district each year through each affected reach of the aqueduct.

The project transportation facility that would be used to provide water to the District is the portion of the California Aqueduct from the Sacramento-San Joaquin Delta to the junction of the Coastal Aqueduct. The elevation of the water surface in the California Aqueduct is approximately 313.5 feet near Kettleman City and decreases to approximately 310 feet at the Kern County line.

The total transportation capital cost allocated to the District is estimated to be $4,052,600 for a maximum annual entitlement of 50,000 acre-feet at a maximum monthly peaking rate of 18 percent.

Under Article 24(c) of the standard provisions, the construction or capital cost component of the transportation charge allocated each year to a contractor must be paid in 50 equal annual payments of principal and interest. Article 45 of the prototype contract, however, provides for modified payments of this component by agricultural contractors. Agricultural water deliveries may be paid for at a unit rate per acre-foot. This is the method of payment assumed herein. The unit rate is estimated to be $5.19 per acre-foot. Payment at this rate commencing in the initial year of water delivery will repay all principal, with compound interest, of the estimated project transportation capital costs allocated to the District within the project repayment period.

The estimated minimum and variable operation, maintenance, power, and replacement components, as well as the capital cost component, of the Transportation Charge and the Delta Water Charge for deliveries to the District are shown in Table 4.

The determination of charges under the contract as described above and as summarized in Table 4 does not result in a uniform charge per acre-foot of entitlement water throughout the repayment period. However, since major portions of the total charge are on a unit rate basis, the total charge is fairly uniform. Equivalent unit rates have been computed for the purposes of comparison of components of the total charge for delivering to the District the entitlements of water shown in Table 4. The equivalent unit rate is defined as that constant charge which, when assessed against each acre-foot of delivery during the entire repayment period, will

produce an amount by the end of the period equivalent to the sum of the annual charges which would have been assessed under a water supply contract, together with interest computed at the project interest rate. The project interest rate is assumed to be 4 percent per annum. The total estimated equivalent unit rat for service of annual entitlements to the District under these as tions is $16.89 per acre-foot at canalside as shown in Table 4.

Cost of Surplus Water

Article 21 of the standard provisions provides that if during any year the supply of project water, after appropriate allowance for holdover storage, exceeds the total of annual entitlements of all contractors for that year, the State shall offer to sell and deliver such surplus water for periods expiring not later than the end of such year. The charge for surplus water shall be at least equal to the variable operation, maintenance, and power costs incurred in service of such water. This would include variable charges for both the conservation and trar portation facilities.

Under terms of recent agricultural contracts which contain an amendment to Article 21, the variable operation, maintenance, power, and replacement costs would equal the total charge for surplus water used for agricultural or ground water replenish ment purposes.1/ Under these terms, each contractor shall have the right to contract, for agricultural and ground water replenis ment use, a portion of the total amount of surplus water availabl

1/ Article 45(a) of contract between Dudley Ridge Water District and State dated December 13, 1963.

in any year. This portion shall bear the same ratio to the total amount of surplus water available in that year as the sum of the annual entitlements delivered to the contractor for agricultural and ground water replenishment use during the preceding three years bears to the total amount of such annual entitlements delivered for agricultural and ground water replenishment use during the preceding three years of all contractors requesting surplus water. The duration of contracts for surplus water under these terms may exceed one year.

The unit rate for surplus water used for agricultural purposes in Kings County is estimated to range from $3 to $4 per acre-foot. It is estimated that surplus water will be available to the District on an irrigation demand schedule through 1981. The equivalent unit cost for delivery of entitlement and surplus water is about $14.92 per acre-foot over the repayment period for the assumed deliveries shown in Columns 2 and 3 of Table 7.

Surcharge

A surcharge equivalent to the power credit per acre-foot of water will be made for project water put to agricultural or manufacturing use on excess land. This surcharge is provided for in Article 30 of the standard provisions, and is established as $2 per acre-foot until all of the facilities for generation of electrical energy in connection with the operation of initial project conservation facilities are installed and in operation. Each year thereafter the State shall redetermine the power credit per acre-foot of water. Excess land is defined as that part of any land in excess of 160 acres in single beneficial ownership,

or 320 acres in joint ownership by husband and wife. The surcharge would be applicable to entitlement water and surplus water.

Surcharge Credit

Under terms of recent agricultural contracts, the State may allow a credit to the contractor not to exceed the surcharge to be paid by such contractor, which credit shall be utilized to reduce the cost of water for agricultural use on other than excess land at a uniform rate not to exceed $2 per acre-foot.2/

Cost of Local Distribution

A locally constructed and financed distribution system will be required to convey water from the California Aqueduct to areas of use within the District. For purposes of distributing water, the District is well situated with respect to the California Aqueduct, as shown on Plate 2. Nearly all the District land lies to the east and at a lower elevation than the California Aqueduct. A preliminary design for an irrigation distribution system for land in Zone I has been made for purposes of estimating costs.

Design Criteria for Irrigation Distribution System

The irrigation distribution system as designed would provide capacity to divert and distribute 18 percent of the District's maximum annual entitlement in a one-month period. Sufficient laterals have been provided so that each 160-acre parcel assumed to be irrigated by the system would have a turnout.

2/ Article 45(b) of the contract between Dudley Ridge Water District and the State dated December 13, 1963.

It has been assumed that the Zone I land lying below the California Aqueduct would be served by gravity systems consisting of concrete-lined canals or reinforced concrete pipe. It has also been assumed that the small portion of the land in Zone I above the aqueduct will not be provided water service. Consideration has been given to facilities for cross-drainage, access, and road crossings.

Estimated Cost for Irrigation Distribution System

Cost estimates of construction and operation of the distribution system are based on unit cost data adjusted to reflect 1962 prices. The estimated capital cost for the distribution system including turnout structures is $2,400,000.

In the estimates it has been assumed the distribution system would be constructed in two stages, five years apart, to correspond with the demand buildup of entitlement water and surplus water. Although the debt service for each stage has been assumed to be for a 40-year period the total repayment period of the distribution system will be 45 years because of the staging.

Annual costs, including debt service at a five-percent interest rate over 40 years, and operation, maintenance, administration, and replacement are about $96,000 per year for the first five years, $230,000 per year for the next 35 years, and $178,000 per year for the next five years. From then on the costs would be about $100,000 annually for operation, maintenance, administration, and replacement. Capital costs would be repaid by the end of the forty-fifth year. The above annual costs do not in-

clude the estimated capital cost for turnout structures and measuring devices which must be paid to the State prior to the date of construction.

The cost has been determined on an equivalent unit rate basis to allow for comparison of costs over the repayment period of the project. The estimated equivalent unit rate for the cost of construction and operation of the distribution system throughout the 68-year repayment period is $4.54 per acre-foot. This amount comprises $2.48 per acre-foot for repayment of the capital cost and $2.06 per acre-foot for operation, maintenance, administration, and replacement costs. The equivalent unit rate for the distribution system over the 45-year repayment period is about $5.80 per acre-foot.

CHAPTER IV. DEMAND FOR PROJECT WATER

Presented in this chapter are the relevant economic factors and data used to determine project water demand, an estimate of the demand, and a determination of the buildup of demand in the Dudley Ridge Water District. It will be noted that consideration of these economic factors decreases the estimate of "potential requirement for imported water". The estimate appears in Chapter II of this bulletin.

Payment Capacity of Crops

In this report, payment capacity is defined as the amount which is available from gross crop revenues to pay water costs after deducting all other farm production expenses. The appraisal of crop payment capacity per acre-foot of water involves the consideration of crop yields, prices received, crop production costs, and other factors related thereto. These factors are briefly discussed, and a payment capacity determination is presented, in the following paragraphs.

Crop Yields

Crop yields used in this payment capacity analysis were developed following review of Kings County agricultural reports and conferences with local authorities. The yields are projected at a conservative level and are considered attainable by the bulk of the farm operators.

Prices Received

The prices of farm products used in this analysis are essentially the averages of prices received by Kings County

farmers during the 1952-56 period. This information was obtained from the Agricultural Commissioner's reports and conferences with local authorities.

Crop Production Costs

Crop production costs are computed on a per acre basis, using the estimated average unit prices paid during the 1952-56 period for the factors of production, including interest, taxes, and wages. These unit prices are applied to all labor and materials, except water, used in production; cash overhead, such as taxes, repairs, and general expenses; all interest and depreciation; and management charges.

In addition to the foregoing there is included in the crop production costs an allowance for occasional losses attributable to inclement weather and adverse market conditions. This allowance also provides for the slightly increased farming cost associated with share or cash rental arrangements as compared with the cost of owner-operation.

Drainage

Zone I of Dudley Ridge Water District is underlain mostly by rather permeable alluvial fans providing adequate drainage. Toward the easterly portion of the zone, basin deposits of silt and clay are found. There is a possibility that under future irrigated conditions drainage problems might occur in scattered locations in the easterly boundary of the zone. It is expected that most of the basin soils will be planted to crops which are not affected by any except severe drainage conditions. Accordingly, costs of providing farm drainage systems were not included in the

crop production costs. Such drainage problems may eventually arise, but it is believed the additional cost involved would not significantly affect the conclusions reached herein.

Payment Capacity Determination

Estimated crop production costs, excluding cost of water, for each of the projected crops shown in Table 3, on a per acre basis, were deducted from the gross income derived from crop yields and prices received to establish the payment capacity per acre of the particular crop. Payment capacities at the farm headgate for crops in the District are shown in Table 5, "Estimated Annual Payment Capacity for Selected Irrigated Crops in Zone I of Dudley Ridge Water District". The payment capacity values for developed lands presently receiving a temporary import supply have been increased by from $5 to $30 per acre as shown in Table 5 to reflect the diminishing value of the sunk investment on such lands.

Most of the data used in the payment capacity determination have been derived from the department's office report entitled "Supplement to Information and Data on Proposed Program for Financing and Constructing State Water Facilities" dated May 1960.

Economic Demand for Water

In this report a water demand schedule is defined as a catalogue of quantities of water that will be purchased at various possible prices at a given time. Such a schedule indicates the relationship of demand for water to cost of water and is presented here in tabular form and as a water cost-demand curve.

TABLE 5

ESTIMATED ANNUAL PAYMENT CAPACITY FOR SELECTED IRRIGATED CROPS
IN ZONE I OF DUDLEY RIDGE WATER DISTRICT
1952-56 Base Period

Crop	Applied Irrigation Water Requirement (Acre-feet per acre)	Payment Capacity of Crops On Undeveloped Land: Per Acre	Per Acre-foot	Payment Capacity of Crops on Presently Developed Land 1/: Per Acre	Per Acre-foot
Excellent Quality Land					
Deciduous fruit and nuts	2.9	$ 107.00	$ 36.90	$ 137.00	$ 47.20
Grapes	3.1	95.00	30.60	125.00	40.30
Cotton	3.8	97.00	25.50	127.00	33.40
Potatoes	3.0	100.00	33.30	130.00	43.30
Miscellaneous truck	2.4	88.00	36.70	113.00	47.10
Sugar beets	2.9	66.00	22.80	91.00	31.40
Miscellaneous field	2.1	37.00	17.60	52.00	24.80
Alfalfa, seed	3.2	26.00	8.10	41.00	12.80
Pasture	4.1	25.00	6.10	40.00	9.80
Grain	1.1	17.00	15.50	27.00	24.50
Medium Quality Land					
Cotton	3.8	62.00	16.30	82.00	21.60
Sugar beets	2.9	36.00	12.40	51.00	17.60
Miscellaneous field	2.1	29.00	13.80	39.00	18.60
Alfalfa, seed	3.2	24.00	7.50	34.00	10.60
Pasture	4.1	25.00	6.10	40.00	9.80
Grain	1.1	13.00	11.80	18.00	16.40
Poor Quality Land					
Cotton	3.8	31.00	8.20		
Miscellaneous field	2.1	13.00	6.20		
Alfalfa, seed	3.2	12.00	3.80		
Pasture	4.1	16.00	3.90		
Grain	1.1	6.00	5.50		

1/ Developed lands assumed to have greater payment capacity because of sunk investment factor.

A water demand schedule is based on the principle that as the price of water decreases the demand for water increases and, conversely, as the price increases the demand decreases. This difference in demand occurs because different crops possess different abilities to pay for water, different lands have different abilities to grow crops, and operators with sunk investments vary from other operators in their willingness to pay for water. Some crops such as grapes, truck, cotton, and deciduous fruit and nuts have greater abilities to pay for water than crops such as grain, alfalfa, amd miscellaneous field crops. Farm operators will normally grow only those crops which, as a minimum, return all the variable costs of production. Consequently, with high-cost water only the crops with higher payment capacities would be grown, but with low-cost water a larger amount of water would be purchased to irrigate crops with both high and low payment capacities.

The payment capacities of the various crops grown on land of various classes and on land of different stages of development have been arrayed by magnitude in Table 6, "Water Demand Schedule for Zone I of Dudley Ridge Water District". Values in this table were used to plot the curve shown on Plate 3, "Irrigation Water Cost-Demand Curve for Dudley Ridge Water District".

With an assumed water toll by the District of $20 per acre-foot, as is shown for the initial years in Table 7, the irrigation water cost-demand curve indicates there would be a demand for about 45,000 acre-feet of water.

TABLE 6

WATER DEMAND SCHEDULE FOR ZONE I
OF DUDLEY RIDGE WATER DISTRICT

Crop	Land Class	Projected Crop Acreage on: Undeveloped Land (In acres)	Projected Crop Acreage on: Presently Developed Land (In acres)	Water Requirement (In acre-feet per acre)	Water Requirement (In acre-feet)	Payment Capacity: Per Acre-foot	Cumulative Water Requirement (In acre-feet)
Deciduous fruit and nuts	Excellent		540	2.9	1,566	$ 47.20	1,566
Miscellaneous truck	Excellent		724	2.4	1,738	47.10	3,304
Potatoes	Excellent		324	3.0	972	43.30	4,276
Grapes	Excellent		292	3.1	905	40.30	5,181
Deciduous fruit and nuts	Excellent	860		2.9	2,494	36.90	7,675
Miscellaneous truck	Excellent	1,426		2.4	3,422	36.70	11,097
Cotton	Excellent		2,111	3.8	8,022	33.40	19,119
Potatoes	Excellent	676		3.0	2,028	33.30	21,147
Sugar beets	Excellent		459	2.9	1,331	31.40	22,478
Grapes	Excellent	408		3.1	1,265	30.60	23,743
Cotton	Excellent	3.589		3.8	13,638	25.50	37,381
Miscellaneous field	Excellent		1,480	2.1	3,108	24.80	40,489
Grain	Excellent		600	1.1	660	24.50	41,149
Sugar beets	Excellent	741		2.9	2,149	22.80	43,298
Cotton	Medium		210	3.8	798	21.60	44,096
Miscellaneous field	Medium		324	2.1	680	18.60	44,776
Sugar beets	Medium		27	2.9	78	17.60	44,854
Miscellaneous field	Excellent	3,220		2.1	6,762	17.60	51,616
Grain	Medium		410	1.1	451	16.40	52,067
Cotton	Medium	1,890		3.8	7,182	16.30	59,249
Grain	Excellent	1,300		1.1	1,430	15.50	60,679
Miscellaneous field	Medium	1,676		2.1	3,520	13.80	64,199
Alfalfa, seed	Excellent		810	3.2	2,592	12.80	66,791
Sugar beets	Medium	473		2.9	1,372	12.40	68,163
Grain	Medium	1,260		1.1	1,386	11.80	69,549
Alfalfa, seed	Medium		162	3.2	518	10.60	70,067

The curve is based on a consideration of the payment capacity of each crop alone, with no allowance for averaging among crops. Theoretically, for a given cost of water, only those crop and land combinations would be utilized which have payment capacities greater than the cost of water. It is believed, however, that within farm units, there will be some averaging; that is owners will to some extent utilize the excess of payment capacity over cost of some crops to assist in the purchase of water for crops with payment capacities less than water costs. The growing of the latter crops would be desirable for crop rotation purposes. For this reason, it is believed that the economic demand for water in the District will be at least 50,000 acre-feet per year.

Theoretically, the crop pattern for a given quantity of water would comprise those crops appearing above the quantity in the "Cumulative Water Requirement" column of Table 6. Adjustments could be made to such a crop pattern to best fit it to the given water quantity. It is believed in the present case, however, that any effort toward refinement of the projected crop pattern would not significantly modify the above determination of water demand.

Water Demand Buildup

The department's projected rate of water demand buildup in the District is based on the estimated future market demand for crops. The demand buildup requested by the District and subsequently contracted for is approximately the same as that proposed by the department. Therefore, in this report the District's request for annual entitlement has been used. The projected rate

of demand buildup for entitlement water to the 1990 quantity is presented in Column 2 of Table 7.

Surplus water, with its effect on the weighted cost of all irrigation water, is expected to allow the farming of a moderate acreage of lower value nonspecialty crops. The amounts of surplus water assumed to be delivered on an irrigation demand schedule are shown in Column 3 of Table 7.

CHAPTER V. FINANCIAL FEASIBILITY

The previous chapters indicate that there is an economic demand for at least 50,000 acre-feet of water to irrigate land in the Dudley Ridge Water District. Presented in this chapter is an analysis which demonstrates the feasibility of a plan for the repayment by the District of the long-term debt which must be undertaken in order to deliver project water to the users' headgates.

Although the cost of the facilities to the District will be relatively high, it is shown in Table 7, "Financial Analysis - Dudley Ridge Water District", that the District will not be unduly burdened by its debt incurred for purchase and distribution of water during the project repayment period. Furthermore, it is demonstrated that the method of obtaining funds under the plan for debt repayment is practicable and reasonable.

The analysis indicates that the District can meet, on a year-to-year basis, the cost of project water and the cost of a distribution system to get the water to the land. It is believed that the information presented herein justifies the contract between the State and the District for a supply of 50,000 acre-feet of water annually.

Financial Analysis

The various factors entering into the financial analysis are discussed in the following paragraphs. The analysis is presented in Table 7 which appears at the end of the report.

Water Toll

A water toll method of recovering water costs has been utilized in this analysis. Assumed District water tolls for

annual entitlements and surplus water are shown in Columns 5 and 7 of Table 7. In the initial years, a charge of $20.00 per acre-foot has been assumed to recover all costs, including the cost of turnout structures and measuring devices, and to provide excess revenue to insure against deficit spending in 1972, when surplus water is not expected to be available.

For the periods 1973 through 1984 and 1985 through 1988, tolls of $18.00 and $20.00 per acre-foot, respectively, have been assumed. The increase is necessitated primarily by the decrease of surplus water on an irrigation demand schedule. These tolls will allow total revenues to equal total costs by the end of 1989. For the remainder of the repayment period the assumed tolls will balance costs on a year-to-year basis. It will be noted in the analysis that no revenues from the sale of surplus water have been assumed after 1981. Some surplus water would probably be available at off-peak times after that year, but it has been assumed it would be sold at or near cost. Costs and tolls would therefore remain in balance.

Assessed Valuation and Bonded Indebtedness

The 1962-63 assessed valuation of the District was about $394,000. The Dudley Ridge Water District has no bonded indebtedness at the present time. There is also no bonded indebtedness assigned to the area from overlying or coterminous units.

Financial Analysis Table

Presented in Table 7 is a year-by-year summary of the assumed revenues from sale of water by the District; the costs

which would be charged to the Dudley Ridge Water District by the State for annual entitlements and surplus water; the costs which would be incurred by the Dudley Ridge Water District for conveyance and distribution of State water; the difference between revenues and costs or the net operating revenues; and the calculation of balance of funds remaining at the end of each year.

The capital cost for turnout structures and measuring devices from the California Aqueduct must be paid prior to the start of construction. It is estimated that the cost will be $79,000 and it will be due in 1966. In this analysis, it has been assumed that the District would pay this cost in a lump sum financed from a short term loan.

During the early years of the project substantial amounts of revenue in excess of cost are generated. These excess revenues accumulate in 1980 to a maximum of $1,010,500, including interest at 4 percent. Thereafter, the year-end balance is reduced to zero by 1989 and remains so throughout the repayment period.

Although the net revenues are assumed to accumulate interest during the early years of the project, these funds could be used to finance partially the construction of the distribution system and/or make advance payments to the State. The latter would be equivalent to investment of the net revenues at 4 percent if the project interest rate, which is dependent upon the interest rate on bonds sold by the State, averages 4 percent as is presently assumed in making the estimates of water cost.

The financial analysis contains many assumptions as to matters which are in the province of the directors of the Dudley

Ridge Water District. It is believed, however, that the assumptions employed herein are sufficiently representative to demonstrate that not only is the suggested program financially feasible, but that it would remain so with reasonable variation in the assumptions.

An explanation of the column headings of the financial analysis table follows:

Explanation of Column Headings in Table 7

Column Number	Comments
1	Years of the period of analysis commencing in year 1966, the year in which payment for the turnout structures and measuring devices is assumed to be made, and terminating in 2035, the assumed end of the 50-year repayment period following final project construction.
2	Delivery of annual entitlement water. The total demand and the rate of demand buildup are those negotiated by the department and the District.
3	Annual delivery of surplus water on an irrigation demand schedule. Its use terminates after 1981, the estimated last year of availability of such surplus water.
4	Total annual delivery to the District. (Sum of Columns 2 and 3.)
5	Assumed tolls for entitlement water to all users in the District at farm headgate.

6 Total revenue from delivery of annual entitlements of water. (Product of Columns 2 and 5.)

7 Assumed tolls for surplus water to all users in the District at farm headgate.

8 Total annual revenue from delivery of surplus water on an irrigation demand schedule. (Product of Columns 3 and 7.)

9 Total annual revenue from delivery of both classes of water. (Sum of Columns 6 and 8.)

10 Annual repayment requirements for annual entitlements delivered at canalside to be paid to the State on a unit rate basis allowed under provisions of Article 45 of The Metropolitan Water District prototype contract.

11 Cost per acre-foot of delivering surplus water at canalside on an irrigation demand schedule.

12 Total annual cost of delivering surplus water at canalside on an irrigation demand schedule. (Product of Columns 3 and 11.)

13 Total annual cost of delivering both classes of water at canalside. (Sum of Columns 10 and 12.)

14 Total annual local distribution and conveyance costs based on peak demand of 18 percent and 40-year repayment period at 5 percent interest.

15 Total annual cost of delivering both classes of water to the farm headgate. (Sum of Columns 13 and 14.)

16 Difference between cost of delivering both classes of water to the farm headgate and estimated revenue received by the District from the sale thereof. (Column 9 less Column 15.)

17 Balance of available funds from previous year plus net operating revenue collected in current year. (Sum of Column 19 of previous year and Column 16 of current year.)

18 Interest earning on balance of District funds. (Product of .04 and Column 17.)

19 Balance of funds available to District at end of each year. (Sum of Columns 17 and 18.)

CHAPTER VI. SUMMARY AND CONCLUSIONS

The pertinent information presented in this report is summarized and conclusions are presented in the following sections.

Summary

1. The Dudley Ridge Water District was formed in 1963 for the express purpose of obtaining a supplemental water supply from the State Water Project for irrigation of lands of southern Kings County. It may contract with the State for a water supply, construct and operate a conveyance and distribution system to deliver said supply, and obtain funds by water charges and by ad valorem assessment of land.

2. A water supply contract between the District and the State must be approved by the California Districts Securities Commission.

3. The economy of the District is based on irrigated agriculture and livestock grazing. Presently about 9,100 acres are irrigated. It is expected that the purchase of water from the State will enhance the economy and that it will continue to be based on irrigated agriculture and livestock grazing.

4. The California Water Commission, as of December 1963, has allocated 1,547,000 acre-feet of water from the State Water Project to the San Joaquin Valley, including 72,000 acre-feet reserved for the valley from other allocations if needed. At the time final negotiations of a water supply contract between the State and the District were in progress in December 1963, only 1,000,000 acre-feet of this total had been contracted and contracts for 167,500 acre-feet were under negotiation. Thus

379,500 acre-feet of water for annual entitlements were available for contracting with the District.

5. The District has been divided, for investigational purposes, into Zone I, which comprises the better land generally on the west side of the District, and Zone II, the remainder. Although the land in Zone II is irrigable, no water requirement has been determined since it is believed that overall conditions are unfavorable for profitable crop production at the water cost set forth below. Also, as is indicated below, not all of Zone I can be profitably irrigated.

6. There is a potential water requirement of about 85,000 acre-feet annually in Zone I of the District. The determination of this quantity is based on the consideration of all factors except availability and cost of water.

7. The present principal water supply for irrigation of land in the District is conveyed some 40 miles from sources located to the east outside the District. It is planned that this supply will be used outside the District when water is received from the California Aqueduct.

8. Wells in the extreme northern portion of the District provide a small portion of the present water supply. Reuse of percolate from the future imported supply would be possible, but the quality would be unsuitable.

9. The potential requirement for imported water from the California Aqueduct in Zone I is equal to the potential water requirement of 85,000 acre-feet annually, since nearly all the present supply will be discontinued and reuse of percolate of the future imported supply would be impractical.

10. Water from the California Aqueduct can be provided to the District at an estimated equivalent unit rate for annual entitlements of $16.89 per acre-foot at canal side. It is estimated the cost of surplus water will range from $3 to $4 per acre-foot. It is estimated that the equivalent unit charge by the State to the District for annual entitlements and surplus water delivered on an agricultural demand schedule will be $14.92 per acre-foot over the repayment period.

11. The estimated equivalent unit rate for the distribution system for Zone I is about $5.80 per acre-foot (including capital cost and operation, maintenance, administration, and replacement costs) through the year 2007. This rate will decrease to about $2.00 per acre-foot by 2013 when capital costs will have been repaid.

12. Consideration of the payment capacity of crops and the cost for purchase and distribution of water indicates that the demand in the District for water from the California Aqueduct will be less than the potential requirement for such water. The economic demand for such water in 1990 is estimated to be at least 50,000 acre-feet annually.

13. The 1962-63 assessed valuation of the District was about $394,000. The Dudley Ridge Water District has no present bonded indebtedness.

14. The District will not be unduly burdened by its debt incurred for purchase and distribution of water during the project repayment period.

Conclusions

1. The State of California has the necessary water supply and the authority to enter into the contract with the Dudley Ridge Water District which was signed December 13, 1963 for the service of a maximum annual entitlement of 50,000 acre-feet of water and which includes an option to increase the amount of the contract by the District's share of the project yield uncontracted on December 31, 1963.

2. The contractual cost to the District and the cost of construction and operation of a distribution system can be met with agricultural water tolls which would not exceed the ability of users to pay for water.

3. The Dudley Ridge Water District has the authority, the necessity, and the financial capability to enter into the contract with the State of California for the service of a maximum annual entitlement of 50,000 acre-feet of water from the State Water Project.

TABLE 7

FINANCIAL ANALYSIS
DUDLEY RIDGE WATER DISTRICT

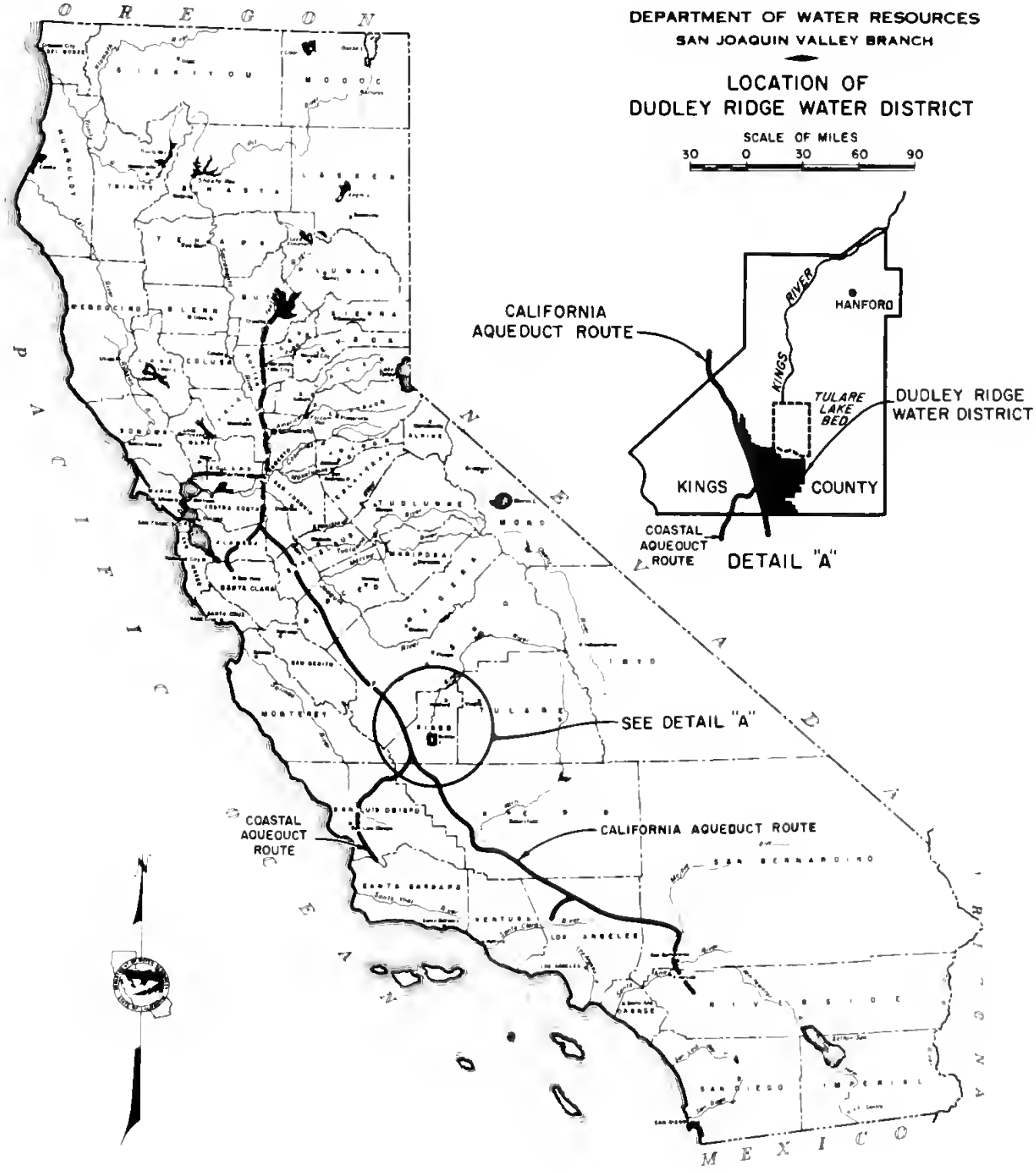
Year	Annual Water Deliveries (In acre-feet)			Annual Revenues					Annual Costs at Canalside				Total Annual Local Distribution & Conveyance Costs	Total Cost: at Farm Headgate	Net Operating Revenue	Balance at Beginning of Year	Interest: at 4%	Balance at End of Year
				Entitlement		Surplus			Entitlement	Surplus								
	Entitlement	Surplus	Total	Per Acre-foot	Total	Per Acre-foot	Total	Total	Total	Per Acre-foot	Total							
1	2	3	2+3=4	5	2x5=6	7	3x7=8	6+8=9	10	11	3x11=12	10+12=13	14	13+14=15	9-15=16	17	18	17+18=19
1966																$-79,000*		
67									$ 4,400			$ 4,400		$ 4,400	$ -4,400	-4,400	$-3,300	$ -86,700
68	10,000	10,000	20,000	$20.00	$ 200,000	$20.00	$200,000	$ 400,000	169,100	$3.02	$30,200	199,300	$ 96,300	295,600	104,400	17,700	700	18,400
69	11,800	5,500	17,300	20.00	236,000	20.00	110,000	346,000	188,800	3.76	20,700	209,500	92,700	302,200	43,800	62,200	2,500	64,700
1970	13,600	4,800	18,400	20.00	272,000	20.00	96,000	368,000	236,200	3.80	18,200	254,400	94,100	348,500	19,500	84,200	3,400	87,600
71	15,500	4,700	20,200	20.00	310,000	20.00	94,000	404,000	256,600	3.86	18,100	274,700	96,500	371,200	32,800	120,400	4,800	125,200
72	17,300	0	17,300	20.00	346,000	20.00	0	346,000	288,200	0		288,200	92,700	380,900	-34,900	90,300	3,600	93,900
73	19,100	19,800	38,900	18.00	343,800	18.00	356,400	700,200	312,600	2.90	57,400	370,000	219,300	589,300	110,900	204,800	8,200	213,000
74	20,900	17,400	38,300	18.00	376,200	18.00	313,200	689,400	338,100	2.94	51,200	389,300	218,500	607,800	81,600	294,600	11,800	306,400
1975	22,700	25,400	48,100	18.00	408,600	18.00	457,200	865,800	363,500	3.17	80,500	444,000	231,500	675,500	190,300	496,700	19,900	516,600
76	24,500	19,500	44,000	18.00	441,000	18.00	351,000	792,000	394,400	3.05	59,500	453,900	226,100	680,000	112,000	628,600	25,100	653,700
77	26,300	13,500	39,800	18.00	473,400	18.00	243,000	716,400	420,200	3.21	43,300	463,500	220,500	684,000	32,400	686,100	27,400	713,500
78	28,200	21,800	50,000	18.00	507,600	18.00	392,400	900,000	504,200	3.37	73,500	577,700	234,100	811,800	88,200	801,700	32,100	833,800
79	30,000	20,000	50,000	18.00	540,000	18.00	360,000	900,000	533,600	3.27	65,400	599,000	234,100	833,100	66,900	900,700	36,000	936,700
1980	31,800	18,200	50,000	18.00	572,400	18.00	327,600	900,000	570,000	3.35	61,000	631,000	234,100	865,100	34,900	971,600	38,900	1,010,500
81	33,600	11,800	45,400	18.00	604,800	18.00	212,400	817,200	599,200	3.43	40,500	639,700	227,900	867,600	-50,400	960,100	38,400	998,500
82	35,500		35,500	18.00	639,000			639,000	634,300			634,300	214,700	849,000	-210,000	788,500	31,500	820,000
83	37,200		37,200	18.00	669,600			669,600	662,700			662,700	217,000	879,700	-210,100	609,900	24,400	634,300
84	39,100		39,100	18.00	703,800			703,800	694,100			694,100	219,500	913,600	-209,800	424,500	17,000	441,500
1985	40,900		40,900	20.00	818,000			818,000	723,900			723,900	221,900	945,800	-127,800	313,700	12,500	326,200
86	42,700		42,700	20.00	854,000			854,000	730,800			730,800	224,300	955,100	-101,100	225,100	9,000	234,100
87	44,500		44,500	20.00	890,000			890,000	757,100			757,100	226,700	983,800	-93,800	140,300	5,600	145,900
88	46,400		46,400	20.00	928,000			928,000	784,800			784,800	229,300	1,014,100	-86,100	59,800	2,400	62,200
89	48,200		48,200	20.34	980,300			980,300	810,800			810,800	231,700	1,042,500	-62,200	0	0	0
1990-2007	50,000		50,000	21.38	1,069,100			1,069,100	835,000			835,000	234,100	1,069,100	0	0	0	0
2008-2012	50,000		50,000	20.27	1,013,500			1,013,500	835,000			835,000	178,500	1,013,500	0	0	0	0
2013-2035	50,000		50,000	18.71	935,400			935,400	835,000			835,000	100,400	935,400	0	0	0	0

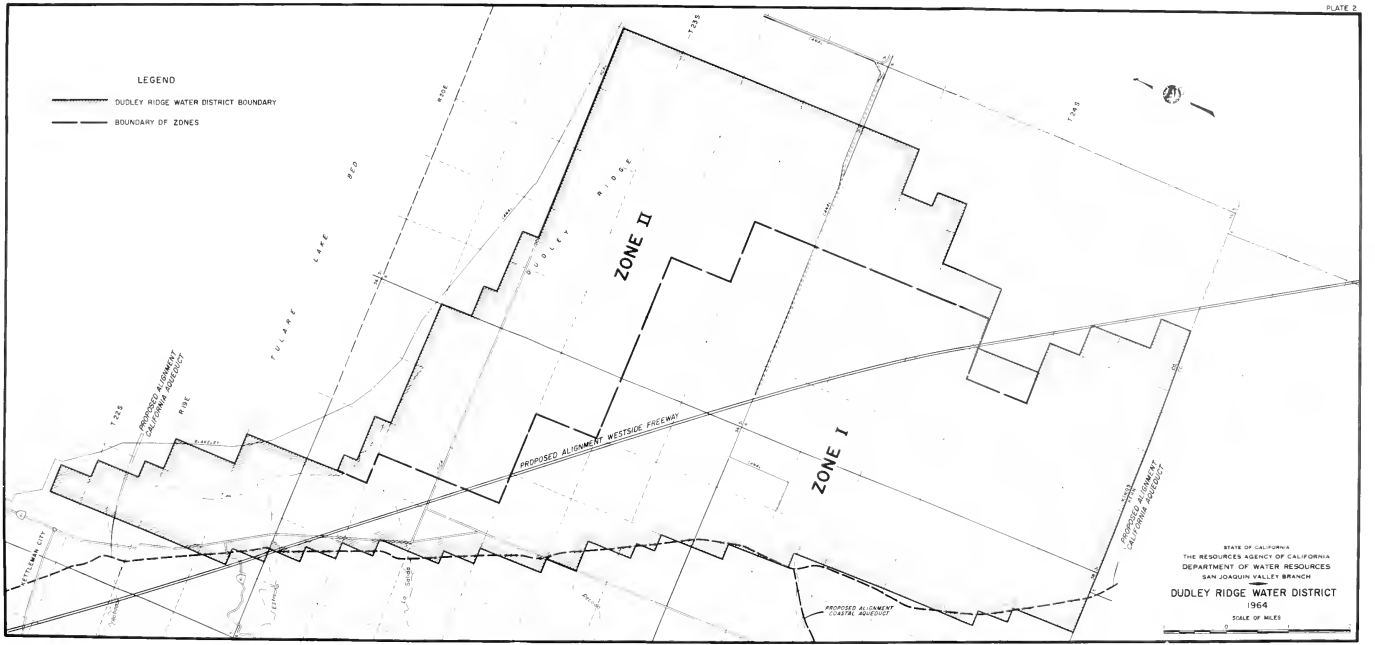
*Lump sum amount for turnout structure.

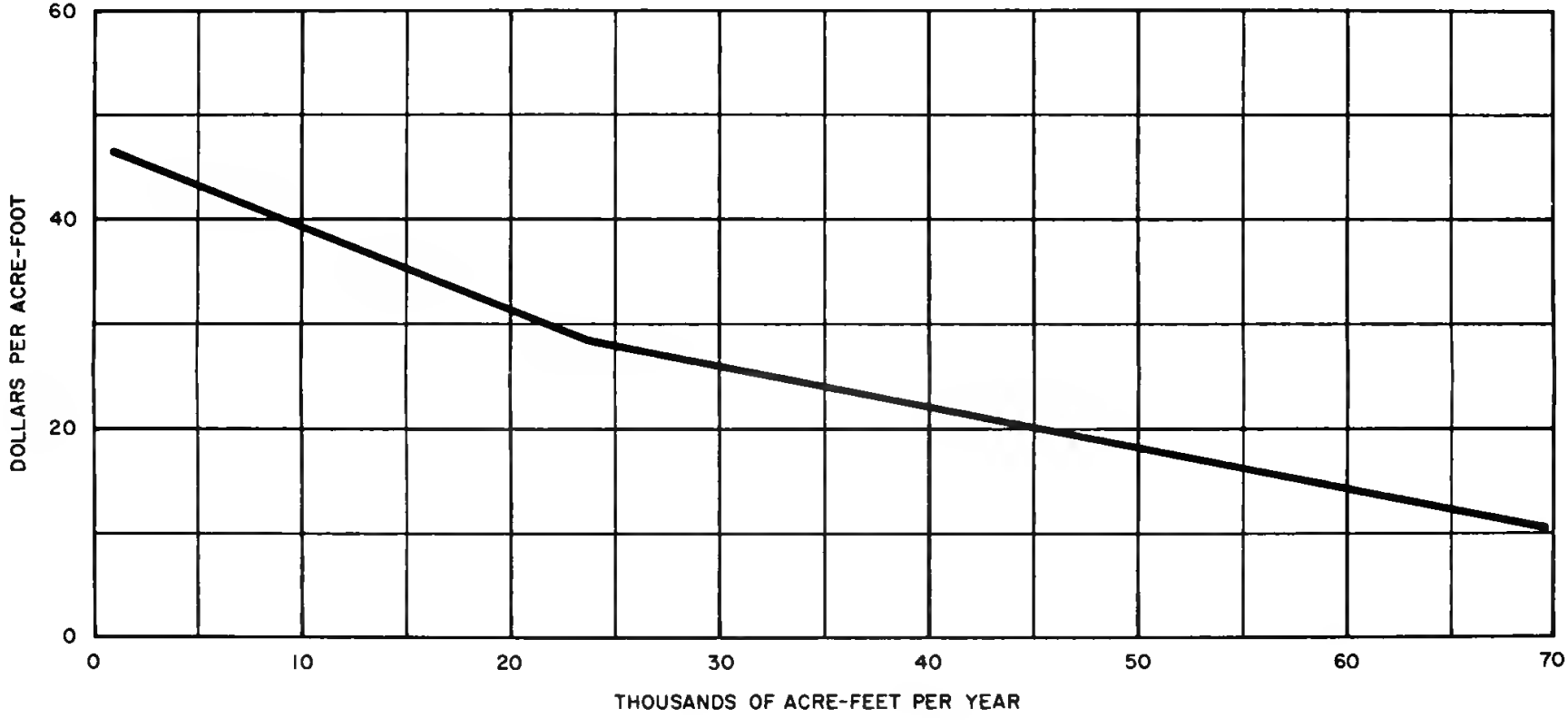
STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SAN JOAQUIN VALLEY BRANCH

LOCATION OF DUDLEY RIDGE WATER DISTRICT

SCALE OF MILES
30 0 30 60 90




LEGEND
DUDLEY RIDGE WATER DISTRICT BOUNDARY
BOUNDARY OF ZONES
ZONE II
ZONE I
DUDLEY RIDGE
TULARE LAKE BED
PROPOSED ALIGNMENT WESTSIDE FREEWAY
PROPOSED ALIGNMENT CALIFORNIA AQUEDUCT
PROPOSED ALIGNMENT COASTAL AQUEDUCT
SETTLEMENT CITY
T.23S
R.9E
R.10E
R.11E
R.12E
STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SAN JOAQUIN VALLEY BRANCH
DUDLEY RIDGE WATER DISTRICT
1964
SCALE OF MILES



IRRIGATION WATER COST-DEMAND CURVE
FOR
DUDLEY RIDGE WATER DISTRICT

PLATE 3

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SAN JOAQUIN VALLEY BRANCH

LOCATION OF DUDLEY RIDGE WATER DISTRICT

SCALE OF MILES
30 0 30 60 90